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PECULIAR ZONAL FORMATIONS OF THE GREAT PLAINS.

By Frederic E. Clements.

The traveller through the sand hills of Nebraska has often brought to his notice the striking way in which nature has marked, as though for all time, the fields and groves which once dotted the country. Such areas are always most conspicuous, because of the strange contrast between their sharply marked dark green and the thin, brown vegetation of the sand hills. Frequently the waste is a flaming mass of the western sunflower, *Helianthus petiolaris*, in which case it is distinctly visible for several kilometers. In many localities, such wastes have existed for more than a score of years, and, instead of diminishing in any respect, become each year more and more accentuated.

The elevated prairies and tablelands, which are so typical of the Great Plains before the latter rise into the foot hills of the Rocky Mountains, are characterized by a floral covering monotonous in the extreme. Trees and shrubs are entirely absent, and undershrubs are present only in peculiar alkaline areas, and in "bad lands." The color-tone of the floral covering is green only for one or two spring months: after the first of June, it becomes a uniform straw color, stretching in all directions to the horizon. The two principal formations of the high plains of western Nebraska are the *Stipa comata* formation, and the peppergrass-cactus formation. Rarely, the former is traversed by a sandy zone several kilometers wide and 20–30 kilometers long, characterized by the *Artemisia filifolia* formation. An individual of *A. filifolia* regarded alone is scarcely green, but the mass of individuals, by contrast with

the straw-colored Stipa, give a dark green tone to the formation. The floral covering, composed of the Stipa and the peppergrass-cactus formations, is seamed here and there with old, abandoned trails, and what may by courtesy be called roads. These have necessarily originated extremely narrow, but often very long, minor tensions between the original floral covering and the invading roadside flora. Along the roads travelled at present, these tensions have attained expression in a narrow zone at either side. In some instances, this zone consists of dwarf individuals of *Helianthus petiolaris*, in others of *Malvastrum coccineum*, or of *Gutierrezia sarothræ*, in still others, of dwarfed plants of *Salsola tragus*, closely appressed, but conspicuous on account of the unusual deep green color. Not infrequently, Malvastrum and Salsola intermingle to constitute the zone. A common result of such a tension in the Stipa formation is to accentuate the size, and density of growth of the Stipa to such a degree that the formation is bordered along the road by a most conspicuous zone composed wholly of its own facies. In the same formation, the Stipa zone is sometimes suppressed, and its place is occupied in part by scattering, silver-purple bunches of *Artemisia frigida*. In trails a long time abandoned, the sterile strip between the bordering zones disappears, being encroached upon and vanquished by the plant constituting these zones. Such trails then become not only striking members of the floral covering, but not altogether canny features of the landscape as well. From the base of Scott's Bluff, a deeply sunken trail extends far toward the Wild Cat mountains in the southeast, marked over sun-browned plain and ridge by an endless band of dark green, due to the dense bunches of *Gutierrezia sarothræ*. The stage-road from Harrisburg over the hills and undulating plains of Kimball county is flanked on either side by a trail, once well-worn, but now densely crowded with the silver-purple tufts of *Artemisia frigida*. These floral land-marks run parallel to the stage route for perhaps a half-score of kilometers, then swinging abruptly to the southwest, they pass on over valley and ridge, disappearing in the one only to reappear upon the other, until the eye refuses to follow further.

It is impossible to determine how long such subruderal formations have persisted. The size and thoroughness of establishment of Gutierrezia and Artemisia would indicate occupation for several decades. After a long period, however, it usually happens that *Stipa comata*, driving out the subruderal inhabitants, reconquers these trails. It is significant that the dark patches of *Opuntia humifusa*, or *O. polyacantha* so characteristic of this formation, never reappear with the Stipa. But even the speargrass is unable to resist the modifying influence of the trail, and its abnormally tall stems and compact growth find easy interpretation in connection with the ruts and ridges on which it grows. The old California trail is the most interesting example of this. Throughout the upper valley of the North Platte in Nebraska, this historic overland route is marked by such a zonal formation. From the base of Scott's Bluff, the California trail, first travelled more than three-score years ago, and abandoned for over a score of years, "angles" southeastward in a broad band of innumerable ruts, painfully insistent in their matted cover of bleaching grass-stems.

THE CRICKET AS A THERMOMETER.

By A. E. Dolbear.

An individual cricket chirps with no great regularity when by himself and the chirping is intermittent, especially in the day time. At night when great numbers are chirping the regularity is astonishing, for one may hear all the crickets in a field chirping synchronously, keeping time as if led by the wand of a conductor. When the numbers are so great, the resting spells of individuals are unnoticed but when the latter recommence they not only assume the same rate but the same beat as the rest in that field. The crickets in an adjoining field will have the same rate, that is, will make the same number of chirps per minute, but with a different beat as one may easily perceive by listening.